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ABSTRACT

This report includes a brief profile of the seminar and a series of comments by the participants. The profile reviews some of the major points that came up during the seminar: a summary of what is known or almost known about Management Information Systems (MIS); some of the core concepts which provide the basis for MIS research, development, and implementation, the need for adaptable MIS and for constant updating of the system; the issue of cost justification; the problem of the communication gap between MIS developers and users; the need for recognition that MIS is a means not an end; the problem of measuring output in educational institutions; and the personnel problem. The comments of the participants reflect these issues and others, including: Analysis and Decision Making, The Human Side of MIS Implementation, Federal Interest in MIS and Planning Models, MIS Adoption and the Educational Environment, The Role of Training Programs in MIS Development, Some Cautions for MIS Development and Implementation, and Social Problems Associated with Measuring Educational Outputs. (AF)

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The Western Interstate Commission for Higher Education (WICHE) is a public agency through which the 13 western states work together

. . . to increase educational opportunities for westerners.
. . . to expand the supply of specialized manpower in the West.
. . . to help universities and colleges improve both their programs and their management.
. . . to inform the public about the needs of higher education.

The WICHE Management Information Systems Program was proposed by state coordinating agencies and colleges and universities in the West to be under the aegis of the Western Interstate Commission for Higher Education. The MIS Program proposes in summary:

To design, develop, and encourage the implementation of management information systems and data bases including common data elements in institutions and agencies of higher education that will:

. provide improved information to higher education administration at all levels.
. facilitate exchange of comparable data among institutions.
. facilitate reporting of comparable information at the state and national levels.

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FOCUS ON MIS

A Report on the WICHE-ACE Higher Education Management Information Systems Seminar, Washington D.C., April 24-26, 1969.

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FOREWORD

Interaction and communication are the catalysts of progress. The wheel, once invented, need not be invented again except by those who remain ignorant of its existence elsewhere. Management information systems are being developed simultaneously by various higher education agencies and individual institutions across the nation. How much duplication of trial and error discovery has occurred? How much frustration, disappointment, and costly error might have been avoided if more experiences had been shared? These questions are impossible to answer accurately, but it is safe to assume that semi-isolated MIS developmental efforts have resulted in a good deal of wasted motion.

At the WICHE-ACE National Seminar on MIS, analysts identified as having had significant MIS experience presented formal papers pertaining to their work. Those formal papers have been published by WICHE under the title, *Management Information Systems: Their Development and Use in the Administration of Higher Education*, and are available to all interested persons.

The seminar also provided a mechanism for bringing educational administrators into direct contact with technical developers. The users (administrators and representatives of education related agencies) listened to the presentations of the technical papers and took advantage of the informal portions of the seminar to mingle with the developers and discover something of their interests, background, and aspirations.

To say that those administrators in attendance were keenly interested in the potentials of management information systems would be an understatement. Familiarity does not necessarily breed contempt, not when those with whom one becomes familiar are found to be astute, ethical, and honestly concerned about the future. On the other hand, ignorance seems nearly always to breed suspicion. In the past, too many administrators appear to have been uninformed and hence suspicious of developers of management information systems. If even the few potential MIS users at the seminar gained an understanding of the fact that analysts, too, are human and that in most cases they seek only to aid the administrator in his difficult decision-making role, then the seminar could be called a success.

Perhaps some analyst in attendance discovered a "wheel" he will not now have to invent. Perhaps some administrator gained a better understanding of the complications of the analyst's life. Perhaps some participants came to the realization that both users and developers have a great deal to learn from one another. It is always difficult to assess the relative success or impact of human encounters. This publication does not attempt to evaluate the national seminar or to promote management information systems. Rather, it seeks to report in an objective fashion those aspects, recurring themes, comments, and reflections which characterized the meeting. It is hoped that through this publication WICHE will allow some of those who attended the national seminar to share their perceptions relative to MIS in an honest, straight-forward manner with a wide range of educators who were unable to attend the meeting in person.

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Boulder, Colorado
October, 1969

CONTENTS

Participants and Observers vii
Profile of the Seminar 1
Analysis and Decision-Making 9
John Keller, Director, Office of Analytical Studies, University of California, Berkeley
"Better analysis will help administrators know when intuitive judgments are sound. A single calculation is worth more than a thousand speculations."
The Human Side of MIS Implementation 11
John Caffrey, Director, Commission on Administrative Affairs, American Council on Education
"MIS developers are in the delicate position of being missionaries who are asking the pagans to pay for their own conversion."
Some Cautions for MIS Development and Implementation 13
Roy Lieuallen, Chancellor, Oregon State System of Higher Education
"The academic enterprise is perilously close to being ungovernable."
Federal Interest in Management Information Systems and Planning Models 14
Justin Lewis, Study Director, Science Education Studies Group, National Science Foundation
"MIS will be of great value to those involved in providing support and using the outputs of institutions as well as to those directly responsible for administration of colleges and universities."
MIS: An Evolving Tool for College Administrators 15
Albert W. Brown, President, State University of New York, Brockport
"What seemed profound at the time of the Seminar may become less significant with the passage of time . . . ."
Social Problems Associated with Measuring Educational Outputs 16
Richard Wilson, Director, New Institutions Project, American Association of Junior Colleges
"Attempts to identify and measure outputs . . . will cause considerable controversy and consternation within the educational community."
Educational Progress Through Use of the Newer Management Technologies 17
Adolph Koenig, Chief, Organization and Administration Studies Branch, Division of Higher Education Research, Bureau of Research, U.S. Office of Education, Department of Health, Education, and Welfare
"Concern among institutional leadership for strengthening management is high: the tendency for adopting the newer techniques and practices is great."
MIS Adoption and the Educational Environment 18
William W. Jellema, Executive Associate and Research Director, Association of American Colleges
"One of the major problems confronting MIS developers is the people problem: the problem of acceptance of potential users."
The Role of Training Programs in MIS Development 19
James Farmer, Director, Informations Systems, The California State Colleges
"MIS techniques are neither complex nor deceptive. However, those who would use such techniques must have perseverance until essential skills are acquired."

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FOCUS ON MIS

PROFILE OF THE SEMINAR

Widespread recognition of the need for more and better information to serve as a basis for administrative planning and decision-making in higher education has led to the initiation of a number of significant MIS projects. Some of the more recently sponsored efforts include Project INFO at Stanford University, the CAMPUS Project of the Systems Research Group at Toronto, Canada, and the Management Information Systems Program of the Western Interstate Commission for Higher Education at Boulder, Colorado.

Individuals representing these efforts as well as other persons known to have had experience in the field of MIS development recently attended a National Seminar on Information Systems and Analytical Models in the Administration of Higher Education. This seminar, sponsored jointly by WICHE and ACE, with support from NSF and USOE, was held at the Sterling Institute in Washington, D.C., on April 24-26, 1969. The specific purpose of the seminar was to illuminate the current state of the art with regard to Management Information Systems.

THE CURRENT STATE OF THE ART

During the concluding session of the meeting, John Caffrey, director of the Commission on Administrative Affairs of the American Council on Education, presented a brief statement which succinctly summarized what had been said about the current state of the art with regard to development and implementation of MIS. Dr. Caffrey referred to his summary as a list of "what we know, or are close to knowing." Since the points he made illuminate the current situation and spotlight those tasks which lie immediately ahead for MIS developers, they seem worthy of reiteration.

We know, or are close to knowing:

1. How to automate, through the use of data processing equipment, most of the routine operational data transactions of higher educational institutions and thus increase the efficiency and convenience of institutional record-keeping.

2. How to construct simulation models to test the broad cost implications of alternative policies and programs.

3. How to relate institutional characteristics to observable student behavior (e.g., dropouts, pursuit of graduate degrees) in order to gain better understanding of the impact of given institutional characteristics on various categories of students.

4. That management information systems do not manufacture automatic decisions but only indicate probable consequences of alternative actions and that there is no assurance that MIS derived information will be used properly by those responsible for making decisions.

5. That different executives respond with different degrees of acceptance and skepticism to a vastly enlarged information supply provided by management information systems and that administrators must be motivated to appreciate and demand better management information before the development of the kinds of systems which are now technically feasible will become widespread.

6. That implementation of management information systems will ultimately result in basic changes in higher education administrative style and structure.

7. That the ideal, precisely accurate and "total" information system is at this time an unattainable myth and that for the foreseeable future we shall have to be content with those increments of progress which can be produced through use of approximations and summaries from relatively gross data.

8. That there are at least four non-technical, administrative audiences to be reached in training, orientation, and proselyting: those who have made a start and are having trouble, those who have seen the light and are seeking help in getting started, those who are aware of the potentials but are skeptical or half-heartedly resistant, and the hard-core heathens.

SEMINAR DISCUSSION: RECURRING THEMES

A number of informative and provocative papers were presented at the national seminar. These papers identified some of the core concepts which provide the basis for MIS research, development, and implementation.

The core concepts are:

1. *Identification of the problem is the essential starting point*. The impetus for any management information system must come from the identification of problems by educational leaders and decision-makers. There is general consensus that any problem which is difficult to solve because of inadequate information may provide the starting point for developing a management information system.

2. *Models are tailored to specific problems*. Models are the key mechanisms of management information systems. Analysts construct models to derive specific information which will be useful to the administrator as he makes decisions related to specific problems.

3. *Operation of models requires a data base*. Using a broad definition, models may be said to range from simple formulae to complex representations of interacting processes, devices, or concepts. Thus, models are mechanisms for deriving new information from data already available, and it follows that the operation of models requires a data base.

4. *A data base is composed of discrete data elements*. A data base is a collection of discrete items of information referred to as data elements. Every institution now has a data base of some sort, since every institution collects data elements related to students, finance, staff, facilities, etc. The storage of these data elements, in such a manner that they will be readily accessible for institutional use, requires a data processing system of some kind.

5. *Models may be unique or standardized*. Two or more different models may be used with identical data elements to derive two or more different kinds of information. From a standard set of data elements, a model unique to a given institution may derive unique information to meet the unique needs of the institution; or a standardized model may derive standard information from the same data for comparisons with data from other similar institutions or for standard reporting to federal and state agencies.

6. *MIS may serve both current operational and long-range planning needs of institutions*. Management information systems can simultaneously serve the immediate operational needs, and the planning, programming, and budgeting (PPB) needs of an institution.

In order to initiate meaningful dialogue regarding the core concepts of MIS, opportunity was provided at the national seminar for participants to comment on the papers submitted by the authors. During the formal comments and the open discussions, a number of common concerns, problems, and hopes pertaining to MIS development and use were revealed. A resume of the recurring themes which permeated the comments and discussions is presented below.

Adaptability

The needs and capabilities of institutions vary widely. Not all institutions have extensive computer capabilities, nor do all their information needs require such capabilities. The computer is merely a highly sophisticated tool which makes it possible to process huge quantities of data quickly and efficiently. Actually, relatively sophisticated management information systems can be operated with simple tools when the institution is small or when computer capabilities are limited. Therefore, the use of some sort of management information system is feasible for nearly every size and type of higher education institution.

Information Systems are Dynamic

It is erroneous to think that a management information system, once installed, will continue to operate effectively without updating for any extended period of time. Management information systems are not static. Rather, they require continual maintenance and adjustment in response to changing conditions if they are to provide high quality information. Without continual maintenance, management information systems deteriorate.

A truly functional management information system must be able to accommodate rather than thwart innovation. Indeed, effective management information systems should serve to stimulate needed innovation by providing the kinds of information administrators and faculty can utilize in planning for self-directed change.

Cost Justification

Administrators, when contemplating installation of a management information system for their institutions, will inevitably raise questions concerning whether the claimed "pay-offs" will justify the cost of the operation. That is, they must consider whether the savings in the form of both dollars and personal convenience potentially obtainable through more efficient allocation of scarce resources and improved planning for the future will be greater than the dollars expended to obtain the information required to produce the savings.

In order to keep MIS economically feasible, analysts must continually consider whether the magnitude of the decisions which can be made on the basis of the information derived through the use of any given model justifies the cost of collecting the specific data elements required to "drive" the model. There may be times when the cost of data element collection and processing outweighs the potential "pay-offs" and, therefore, such data element collection cannot be financially justified.

In many cases, the savings in routine operations (e.g., printing of checks or transcripts by computer) made possible by data processing associated with an information system will be more significant in terms of convenience and efficiency than in terms of dollars saved. On the other hand, use of simulation models to prevent planning errors (e.g., in such areas as capital construction) which would be felt for decades could save large amounts of funds and could justify a considerable MIS effort.

Communication Gap

A considerable communication gap currently exists between MIS developers and users. Much of the cause of this gap lies in the differences in background, interests, and training of analysts and higher education administrators. The language and techniques of systems analysis are unfamiliar to administrators. Analysts are rapidly becoming aware of the necessity of keeping administrators fully cognizant of all aspects and implications of their work.

At times, analysts may have been over-zealous in urging administrators to accept and implement large scale MIS programs. When nearly instant pay-offs are implied and the yet to be developed system fails to fulfill expectations, some skepticism will understandably be created. The credibility gap resulting from such an "oversell" approach poses a major problem for MIS developers.

MIS Is A Means, Not An End

A management information system is never an end in itself. It does not produce decisions. Rather, MIS provides a means of deriving better information for use in decision-making within the social and political setting of the institutional environment.

Models must produce information which accurately reflects reality. Given accurate information, the quality of the decisions which are made becomes the responsibility of the administrator, not of the technical system which produced the information.

Any administrator who uses a management information system should acquire a working knowledge of the conceptual framework of the models which are basic components of the system. However, the administrator does not need to know precisely how each model works in mathematical detail. For him, the models can be likened to "black boxes" into which are inserted quantities of data and from which emerge data summaries, trend lines, answers to questions, etc. The administrator's faith in the use of models and the management information systems they support will increase in due time in direct relation to the following:

1. His faith in the personal competence of the system designers.

2. His faith in the accuracy of the data sources.

3. The validity of the predictions and projections derived through use of the system.

4. His successful experience with attempts to use the system outputs to solve the institution's problems.

5. His intuitive feeling, as time passes, that the system reflects reality more comprehensively than he can perceive it without the system.

Information is a source of power. If the administrator defaults or abrogates his responsibility, analysts could become inordinately influential in institutional decision-making by virtue of the power inherent in the information they process. Increasingly, analysts are expressing the conviction that they have an ethical obligation to leave decision-making to others and to provide administrators with the basic knowledge of MIS mechanics which is needed for evaluating information produced as MIS outputs.

Measuring Outputs

The "products" of instruction in institutions of higher education are defined as intangible attributes

of students. Measurement of such intangible outputs as improved student competencies or heightened sense of social responsibility is extremely difficult. However, those who control institutional funding are increasingly demanding more definitive data regarding the value added to students and to the larger society as a result of instructional and other programs. Developers of management information systems are also aware of the need for positive response to the requests for evidence concerning program effectiveness. Measures of pre-program and post-program conditions must be developed so that differences attributable to the program experience can be computed. The "value added" concept poses one of the most difficult, yet important, tasks for the systems analyst.

Personnel Problem

Acquiring and retaining competent analytic personnel will be a major MIS implementation problem for institutions for some years to come. Identification and development of analytic talent from within the institution is currently the only sure way of acquiring people with the expertise required to implement and maintain a management information system. Such an approach requires a good deal of forethought, and many institutions have found that their needs for a functional management information system are increasing more rapidly than competent personnel are being trained.

Institutions frequently indicate the need for assistance in structuring and implementing management information systems which will be useful for planning programs and budgets. In addition, institutions are searching for the means of training personnel who can operate and maintain management information systems in the future. Until these expressed needs are met, most institutions will find it difficult to initiate the management information systems approach to institutional administration.

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PARTICIPANT COMMENTS

No document which intends to adequately elucidate the events, outcomes and impressions produced during a group interaction should be formulated by one agent. Different people will often view the same event with surprisingly different perceptions. It seemed important that any attempt to provide adequate editorial coverage of the national seminar should include comments solicited from a variety of participants. Consequently, a number of those who attended the seminar were asked to reflect on the event and submit a brief statement regarding their concerns or impressions. Those who responded to the request for reflective statements included both technical developers and MIS users. WICHE is most appreciative of their willingness to share their thoughts and is sure the reader will find their comments enlightening and interesting.

(no p.8)

ANALYSIS AND DECISION-MAKING

JOHN KELLER
Director, Office of Analytical Studies,
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More efficient resource allocation decision-making is a growing necessity for colleges and universities. As higher education requests an ever increasing share of the available resources, increased attention is focused on the management of these institutions. Higher education is being called upon for a major contribution to the national welfare, and society is cognizant of the fact that the consequences of selecting poor alternatives when making educational resource allocations are serious. That is, the benefits foregone by choosing a poor set of alternatives are substantial. More sophisticated methods of maximizing the benefits obtained under the constraint of limited resources are, thus, badly needed. Redesign of the overall resource allocation decision-making systems in higher education to include program budgets, cost-benefit analysis, and improved management information systems seeks to meet this need.

The problem of efficient resource allocation decision-making in higher education is compounded by the fact that educational institutions are essentially public sector enterprises. They do not have the usual institutional and environmental aids to efficient choice-making which characterize private sector business enterprises. Also, there is little or no tradition in higher education of professional managerial approaches which include hard analysis of operations. Fortunately, all of this is changing and techniques such as program budgets, operations analysis, and cost-benefit analysis increasingly are being applied to the educational management task.

As we enter the era of widespread use of management information systems, the limitations and proper role of the new management tools should be clearly understood. Discussions held during the national seminar identified certain aspects and features of MIS use which seem worthy of reiteration. In the hurry to implement management information systems, we should not lose sight of the following points:

1. Better decisions depend upon better analysis and not merely on more data. More data will probably have to be collected to facilitate the improved analysis, but simply gathering quantities of data will in no way insure their proper use in analysis.

2. Analysis will often be relatively crude during the early stages of MIS implementation. However, even some rough but timely analysis may prove highly beneficial by pointing out the major consequences of alternatives. Better crudely right than precisely wrong.

3. Personalities and organizations may sometimes get involved in analytic issues. It should be recognized that it is not "who is right," but "what is right" that is of ultimate importance.

4. Analysis of costs without analysis of benefits is relatively meaningless. Both costs and benefits of alternative programs must be available for wise choices. To describe the benefits or usefulness of a program without stating its costs is equally as meaningless as stating a program's costs without a description of its benefits.

5. Intuitive judgments often are sound. However, there is no reason to rely on them when substantiating analysis is possible. Judgment is enhanced, not depreciated, when good, hard quantitative analysis is applied to those portions of problems which can be analyzed. In these cases, guesses and a priori reasoning have no place: a single calculation is worth more than a thousand speculations.

6. The decision-maker is continually confronted with numerous programs competing for implementation. Almost all programs are good. The problem is to determine which programs are worth what they cost. Every decision to spend is equally a decision not to spend. The administrator must always consider the value of foregone benefits of alternative uses of the resources consumed by those programs which are approved.

THE HUMAN SIDE OF MIS IMPLEMENTATION

JOHN CAFFREY
Director, Commission on Administrative Affairs
American Council on Education

The state of the art of PPBS, modeling, and management information systems, is already far ahead of its application. Consequently, implementation has become a growing concern of MIS developers. While we must not cease work on theory, we already know enough to make substantial improvements in practice. The question thus arises "What can and must be done if MIS is to become a practical tool for higher education administration rather than remain an academic exercise of little practical value?"

True implementation of management information systems will not occur in most colleges and universities until such systems are perceived as necessary. Necessary, in this case, means essential for solving problems, arguing successfully for budgets, qualifying for grants, or simply staving off outright disaster.

A major problem in modifying the attitudes and behavior of administrators with respect to implementing management information systems is the language (i.e., jargon) used by many system analysts. Some refer to this as the "jargon barrier." We cannot babble about Markov chains, stochastic processes, multiple regression equations, iterative recursions, or even such terms as "on line," "file intersection," "exogenous vectors," and "input-output matrices" without running the risk of at best losing and at worst alienating the administrative audience. Technicians must be careful, except when cloistered with other technicians, about using metaphors from their work in seeking to communicate the essential concepts of management information systems. A camellia by any other name smells theaceous.

There are five major problems in developing any effective training program. These are:

1. Development of technically sound content.

2. Development of a meaningful, sequential approach which will really communicate the content to the audience.

3. Identifying the major audiences to be served and developing the means of reaching each particular user group.

4. Identifying individuals who have the communication skills and enthusiasm required to lead a successful training program.

5. Allocation of sufficient financial resources to do the job properly.

Training programs bridge the gap between technical developers and those who have need of practical MIS programs within institutions. Even if the product developed by system analysts is extremely good, few will make use of it if the training program does not make the implementation process seem convenient, necessary, and feasible. Those who conduct MIS training programs should not waste time worrying about the hard-core resistors and doubters. We must take advantage of the curiosity and interest of those institutions and administrators who are now willing to encourage or at least permit the development of better management information systems. If we maintain good lighthouses, others will be guided into port.

Training programs and MIS developers must beware of promising too much to administrators. There are still many difficulties in implementing what we know in theory can be done. Small failures will have a disproportionately adverse effect on the amount of faith and support administrators lend to MIS. We are in the delicate position of being missionaries who are asking the pagans to pay for their own conversion. If anything, it is better to promise *less* than we can

deliver. Theory gives birth to technique, but technique alone will not win converts. The technique must work; it must produce results. Widespread acceptance and use of management information systems must ultimately depend on successful function as well as on ingenious technique.

The best salesmen are satisfied customers. The most credible witnesses for management information systems will be those administrators who tell their peers and colleagues about their own successful experiences. Early attempts to place computers on campuses met with some resistance, and it was not until a few administrators spoke in support of these sophisticated tools that the new techniques became widely employed.

Developers and those who conduct management information systems training programs must be especially careful not to claim that models and systems can arrive at solutions which mandate decisions. We may talk about optimizing institutional functions only in terms of objectives and goals *selected by administrators and policy-makers*. It is essential for the good of higher education to leave all major decisions to human intellect and wisdom. Management information systems may provide administrators with data, they may show alternatives and their relative costs and benefits, and they may provide new kinds of information which will assist in decision-making. However, computers and systems have neither authority nor responsibility, nor should we attempt to endow them with such qualities.

SOME CAUTIONS FOR MIS DEVELOPMENT AND IMPLEMENTATION

ROY E. LIEUALLEN
Chancellor, Oregon State System of Higher Education

The state-of-the-art seminar brought together a substantial amount of technical talent with some users of the technology. Although the seminar was designed to review the state-of-the-art in language which would be meaningful to the groups, I, for one, found the communications gap quite wide. It was necessary that I hang onto every word to avoid being left hopelessly behind.

Three conclusions appear to me to be inescapable.

First, the academic enterprise is perilously close to being ungovernable. Improved information systems, of themselves, will not preserve colleges and universities from chaos. On the other hand, they may be among the essentials if chaos is to be avoided. A changed perception of governing responsibility, restructuring of administrative organization, a rather large increase in administrative personnel—all of these may prove to be necessary. In addition, however, improved information systems need to be developed and employed.

Second, information systems face the hazard of over-sell. A given set of accomplishments can be interpreted as either success or failure, depending upon the goals. To illustrate, a decade and a half ago, many advocates expressed almost unbounded optimism about educational television as a panacea. When measured against those anticipations, ETV has been a dismal flop. When measured against more realistic goals, ETV might be judged a rousing success. Let's avoid over-selling information systems, especially insofar as fiscal savings are concerned. Emphasis should be placed, rather, upon effective and timely decision-making.

Third, the successful introduction of sophisticated information systems into the administration of higher education requires that college and university administrators, including presidents, chancellors, deans, and department heads, be given opportunities, and the encouragement, to become knowledgeable about the state-of-the-art. No matter how technically feasible a management information system may be, it will fail as an effective management tool if users do not acquire skill in its application to "real" problems.

FEDERAL INTEREST IN MANAGEMENT INFORMATION SYSTEMS AND PLANNING MODELS

JUSTIN LEWIS
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It has been recognized for some time that the operation of institutions of higher education is becoming more complex. This is due primarily to the increasing demands made by society on these institutions. The continued operation of institutions so that desirable levels of teaching, research and other outputs will be maintained with the limited funds available will require increasingly effective management. This in turn points to the need for the development of new analysis techniques for use during the decision-making process.

Almost a decade ago, the National Science Foundation began supporting a multiuniversity project which developed a conceptual framework for management information systems in institutions of higher education. This project culminated in the report, *Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities*, published by the National Science Foundation. It is commonly referred to as the Henle Report, in honor of Father Henle–for many years at St. Louis University and recently appointed president of Georgetown University–who headed the project. Thousands of copies of this report have been obtained by people interested in the development of management techniques which might prove useful to college administrators. NSF also sponsored several projects designed to develop planning models. This latter support was essentially "seed" money to stimulate the advance the development of planning-model technology.

In accordance with its longtime interest in development of better management information systems and techniques for using management information in the administration of institutions of higher education, the foundation helped initiate and became one of the sponsors of the seminar on "Information Systems and Analytical Models in the Administration of Higher Education." The seminar revealed wide interest in the development of MIS techniques and identified many potential uses of these techniques.

At the seminar, it was noted that practical management information systems will be of great value to those involved in providing support and using the outputs of institutions as well as to those directly responsible for administration of colleges and universities. The National Science Foundation, as an example of a direct user, is concerned with the solution of resource allocation problems, the determination of relative costs of graduate education in various fields and within individual institutions, obtaining knowledge about the range and diversity of graduate costs by various types of instructions, finding objective means of ascertaining the impact of various support mechanisms and levels on institutions, and securing information on expected needs for faculty, space, and other resources.

The development of information systems and planning models should not be considered ends in themselves, but rather as a means of aiding decision-makers by helping them identify problems and by providing assistance to them in choosing alternative courses of action in response to these problems. Periodically, as the MIS art is developed, administrators in institutions of higher education should be brought up to date concerning the usefulness of the new techniques and should be advised as to how they might go about developing information systems and models for their own use. In other words, management information systems must become more than academic exercises if they are to have the hoped for impact on higher education administration.

MIS: AN EVOLVING TOOL FOR COLLEGE ADMINISTRATORS

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The National Seminar on Management Information Systems gave theoreticians, administrators, and computer camp followers an opportunity to contemplate together the existing MIS knowledge base from which worthwhile applications can be derived. The seminar illuminated the fact that an insufficient quantity and quality of communication between developers and consumers has been a contributing factor to the slowness of adoption of MIS techniques. Administrators in higher education must understand the problems and obstacles which confront technical personnel who are seeking to develop practical management information systems. Technical developers must appreciate the problems and concerns of administrators and must make every effort to create an effective and continuing dialogue with administrators if an MIS product which will really do the job is to be produced.

The soul-searching and general candidness which characterized many of the seminar discussions had the happy effect of creating a plethora of wide-ranging ideas and concepts from which later developments and communications may grow. What seemed profound at the time of the seminar may become less significant with the passage of time and the emergence of sophisticated and implemented systems.

It is apparent that MIS development is currently occurring at widespread but altogether too isolated locations. The seminar demonstrated that there is a great need to pool resources, to merge developmental efforts, and to take advantage of the increments of progress achieved by others.

Management information systems must be conceptualized in a fashion which will allow them to accommodate change. Indeed, they must be devised in such a manner that they can act as instruments for planning, initiating, directing, and evaluating changes.

The role of MIS is central to the operation of higher education. MIS application offers the first real opportunity for examination, analysis, and possible solution of many of our most pressing and discordant problems. The availability of meaningful data in advance of, or concurrent with, decision-making, planning, and analysis must radically alter the structure of administration and the roles of the incumbents.

Institutions may very well be more ready now than ever before to look realistically at their problems and at the shortage of resources to resolve them. The human tendency to resist change may be increasingly neutralized by the imperative of finding solutions. The WICHE project and other programs aimed at developing practical management information systems are timely enterprises. Those who have played an initiating role in MIS development can be pleased with the progress that has been made, but they must also realize that the work of real significance is yet ahead.

SOCIAL PROBLEMS ASSOCIATED WITH MEASURING EDUCATIONAL OUTPUTS

RICHARD E. WILSON
Director, New Institutions Project
American Association of Junior Colleges

Of all the aspirations of the emerging management information systems in higher education, the most difficult to achieve will be a satisfactory approach to measuring the outputs of our colleges and universities. It is one thing to quantify tangible factors such as space, equipment, and dollars and yet another to accurately measure the quality of the effects of the student's educational experience in a particular institution. Certainly, a great deal of work must be done in this area before any agreement is likely to be reached as to the proper approach to such measurement tasks.

Attempts to identify and measure outputs and in turn relate outputs to inputs will cause considerable controversy and consternation within the educational community. It is this process which will inevitably cause basic changes in higher education. As we come to realize that some of the traditional activities and approaches associated with the traditional educational format are relatively unproductive, profound and basic changes in institutional operation will be called for. Probably it is this set of unanticipated consequences that frightens people in higher education. Yet, because of forces outside of higher education, there is little chance of avoiding the issue of output specification and measurement. Since the issue cannot be avoided, it should be approached in a positive and enlightened manner. Only the most impeccable research approaches to the educational output measurement problem will satisfy the academic community and make this aspect of comprehensive management information systems palatable.

EDUCATIONAL PROGRESS THROUGH USE OF THE NEWER MANAGEMENT TECHNOLOGIES

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The growth of American higher education during past decades and in the predictable future gives credence to the notion in our society that education is an instrument of economic, social, and intellectual realization. Because our institutions face unprecedented growth, the challenge of using limited resources to expand educational opportunities to larger segments of society is placing considerable stress on traditional practices of institutional governance and management. The reasonable and prudent judgments required of leadership in order to guide institutions successfully in the future will necessitate the application of the newer management technologies in order to strengthen the vital institutional process. Clearly, the broad spectrum of institutional life, including the functions of teaching, research, and community service, will need to be reassessed to provide more benefits to larger numbers of persons.

Concern among institutional leadership for strengthening management is high, and the tendency for adopting newer techniques and practices is great. It would be tragic if the promise of the newer management technologies such as systems analysis, operations research, planning systems, modeling, management information systems, and program budgeting were applied sans consideration of their advantages, limitations, and implications for the setting. The transition to and development of the newer technologies for use in the field is not an inexpensive undertaking, and it appears that some measure of cooperative efforts and cross-institutional sharing will be necessary before effective practices and systems will be available to a large number of institutions. Further, the decision to apply the newer technologies requires institutional assessment which often necessitates modification of established management and organizational practices.

The seminar on higher education management systems, called under the auspices of the Western Interstate Commission for Higher Education and the American Council on Education was supported jointly by the U.S. Office of Education and the National Science Foundation. It was designed to survey the present status of development in one aspect of the newer management technologies, namely, management information systems. From the presentations and discussions, it appears that much remains to be done in order to gain efficient and useful results from such systems. It also seems that, without such systems, institutional management will be seriously handicapped in responding to the problems caused by expanding public needs in education.

The Office of Education has historically been interested in supporting and strengthening educational leadership. Studies across a wide range of administrative and management concerns have contributed to facilitating research, development and utilization of improved practice in the field. Two current projects supported by the Office of Education are of special interest to persons concerned with management information and facilities planning systems. The first, a regional cooperative project among higher education institutions and coordinating agencies to design, develop and implement information systems and data bases including common uniform data elements, is being carried forward at the Western Interstate Commission for Higher Education, Boulder, Colorado. The second, a contract with the University of California, Berkeley, California, focuses on academic building facilities. Under the California project, a planning system for relating academic activities, the instructional environment, user requirements, costs adaptability, and estimates of technical feasibility is being developed in order to formulate performance specifications for academic facilities. Both projects are bringing talented resources to bear on immediate and future concerns of higher education institutions.

Management information systems and other applications of the newer management technologies are important tools in the quest for sound administrative practice. The Office of Education believes that continued and expanded research as well as development and evaluation in this area will contribute toward providing the required knowledge and administrative practice to meet the challenge of realizing the nation's educational aspirations.

MIS ADOPTION AND THE EDUCATIONAL ENVIRONMENT

WILLIAM W. JELLEMA
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Association of American Colleges

One of the major problems confronting management information system developers has little to do with technology or with models and simulation. It is a people problem: the problem of acceptance by potential users.

MIS has sometimes been grandiosely billed as the great hope in the increasingly difficult struggle to understand, guide, and effectively manage institutions of higher education. To the exuberant statement, "MIS is the answer" one should expect the graffitic response: "What was the question?" Anticipating this difficulty, many of those presenting papers at the WICHE seminar firmly iterated that, before employing MIS in the solution of a problem, the problem itself must be clearly delineated. Those who do not know the question will not find the answer in MIS. Data, unlike an endocrine gland, will not secrete their own significance.

There is, further, a gap where there should be a continuum between the simple and the complex. Many descriptions of management information systems and their potential uses jump from the simple and even painfully obvious to the profound—or, at least, to the technically complex. The value of a management information system is not very convincingly demonstrated to potential users when its immediate uses are described in simpleminded terms while its greater potential value tends to be obscured by a camouflage of technical language. The shorthand of developers is a poor substitute for patient prose, and clear description. The potential user needs to understand the art and its methods fully, but not in highly technical terms.

"Management," moreover, is an even dirtier word in many circles of academe than "administration." Since it is often difficult to give away, let alone sell, a dog with a bad name, it is unfortunate that a system for supplying information to support wiser decisions has its problem of gaining acceptance made more difficult because of the suspicious sounding name it bears.

Finally, not everyone responds with the same degree of enthusiasm and satisfaction to the prospect of more information. One needs no information at all to make decisions, especially the most frequent decision: inaction. It is easier to make this kind of decision without information. Even relevant information can be disquieting to the decision-maker. If he is wrong without information he has a defense. If he is wrong with information, he knows that he will be more harshly judged even though the information given him does no more than increase the odds against being wrong. Information is seldom definitive or devoid of the need of interpretation.

The application of management information systems to higher education is still in a primitive stage. If it were not so, the highly promising WICHE project would be far less necessary than is the case. It is fortunate for the development of the art in higher education that this burgeoning field has attracted so many able persons.

THE ROLE OF TRAINING PROGRAMS IN MIS DEVELOPMENT

JAMES FARMER
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If a management information system were only a series of computer programs, it would be simple for an institution to process data, and there would be no necessity for training programs. If management is to learn to use and trust the results of MIS, if data processors are to regard MIS as more than another set of periodic programs to be run, if the clerical staff are to view MIS demands as a vital task, or if MIS developers see their task as more than writing programs, then the management information system must relate to both its users and developers. For this reason training is an important component of MIS development.

The purpose of MIS is to provide a better management tool. By its nature it must, therefore, be the basis for change. This change can precipitate a hostile attitude by those who view MIS as merely centralization of authority rather than the opportunity to relieve management of many tedious tasks so that it may become creative instead of clerical.

For public institutions MIS will not only impel fundamental changes for the institution itself, but may change its relationships to federal and state governments. Since the produced information is available not only to the institutions' management, but to those public officials responsible for funding higher education, management, perforce, must improve.

The training necessary to support a MIS then spans the institution. It requires the understanding and involvement of everyone from the many clerks to the organizational head. They must understand the project, participate in the development, and contribute to the implementation.

Several specific audiences which must be reached with different styles and types of training programs can be identified. These audiences include the top administrators, middle management of the educational institutions, data processors, and clerical personnel.

The top administrators should be aware of the kinds of information a MIS can produce. This audience needs to thoroughly understand the application of models to problems which demand decisions. Furthermore, top management must be appraised of the probable impact of MIS on college administration and its relationship to control agencies. Training programs for top management must vie for time with many other pressing matters and responsibilities and, hence, should be concise presentations which speak to the administrator's needs and interests while avoiding the burden of unnecessary technical underpinnings.

Middle management needs to understand the kinds of information required to support the MIS and the kinds of output required to facilitate the desired impact on institutional operations. It is middle management which must learn to implement a MIS in an educational institution. To do this, they must be provided with supporting materials such as standards, implementations manuals, and MIS project descriptions. They should also understand MIS development conceptually as well as the specifics of their institution's chosen alternative form of implementation. While this actually requires considerable involvement on the part of middle management, it can be rewarding by developing an understanding of alternative ways of performing the middle management functions. Also, contact with other institutions, in this framework, provides an efficient learning mechanism and tends to improve the quality of management.

Unfortunately many data processors, responding to the critical day by day requirements of their institutions, have not found opportunity for professional growth. MIS is not an extension of production programming, but requires, on the part of the data processor, an understanding of overall project goals, of alternate methods of performing the required tasks, and of the impact of implementation on the using offices. MIS implementation provides a way to review the data processing capabilities, to contribute creatively to alternatives, and to develop a continuing and close relationship between management and the information operating part of the organization.

Data processors need to understand the conceptual design of management information systems and the techniques of implementation. In addition, they should be cognizant of policies, programs, procedures, operational requirements, and hardware and software alternatives for supporting MIS. They should understand the methods of coordinating, at the technical level, MIS development, testing, and implementation. These competencies can be developed through the use of written standards and system descriptions presented and explained in seminars, working sessions, and technical briefings.

A MIS rests on its data base, and can be no better than the quality and timeliness of those data. All clerical personnel, both supervisors and clerks, must receive some kind of training on the specific procedures necessary for the newly introduced system. They should participate in transition planning and be fully aware of the direction, magnitude, and timing of changes which implementation requires. While this training is typically a function of the institution itself, briefing sessions of clerks, supervisors, and office managers are worthwhile both to improve the quality of data and the willingness of the office personnel to support what may be a difficult change.

Since conceptual understanding is required, training for management should occur before systems design and continue–with increasing technical emphasis–until implementation. The training program for data processors is both long and time consuming. Hence, it shoud begin as soon as practical. Early briefings of supervisory and clerical personnel on the goals and objectives of the MIS may relieve anxiety and even generate interest.

On the other hand, training should not occur too early–raising unfulfilled anticipations or becoming obsolete through changes in the project or the technology. As a rule, conceptual material should be presented early and specific or technical material presented just before the information is required for the project.

MIS techniques are neither complex nor deceptive. However, those who would use such techniques must have perseverance until essential skills and knowledge are acquired. To fail to recognize that training is a basic component of MIS implementation will, at best, create frustration and, at worst, render the entire MIS effort a useless endeavor.

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